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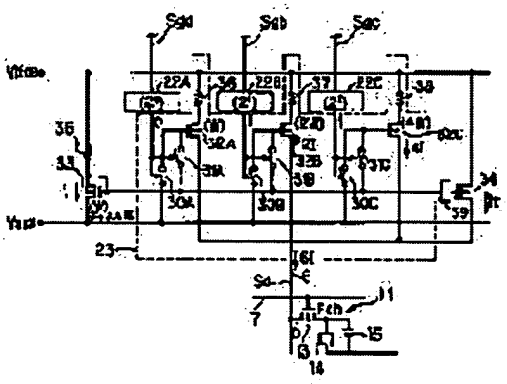
(54) DISPLAY DEVICE AND ELECTRONIC EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a display device capable of driving a light-emitting element by using a driving current having a high amperage, and restraining a waste current consumption for lower power consumption.

SOLUTION: This display device comprises a current driving type light-emitting polymer 14 included in each of pixels 11 formed in a matrix, and a current addition type D/A converter 23 which converts digital image signals (Sga, Sgb, Sgc) to analog image signal Sa by adding an unit current having a predetermined unit current amount according to a digital value included in the digital image signals (Sga, Sgb, Sgc), and makes each light emitting polymer 14 self-luminescent by applying the analog image signal Sa to each light emitting polymer 14 through a date line 6 and a TFT(Thin Film Transistor) 13.



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* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] This invention The light emitting device of current drive molds, such as the so-called light-emitting polymer, (namely, light emitting device from which luminescence brightness changes in proportion to the amount of current passed by the element), The thin film transistor which controls luminescence actuation of the light emitting device concerned (TFT (ThinFilm Transistor) is called hereafter.) It belongs to the technical field of electronic equipment equipped with the display and the display concerned of the active-matrix mold which it had for every pixel, and belongs to the technical field of the electronic equipment which equipped details with the drive method of the light emitting device concerned, and the light emitting device concerned more.
[0002]
[Description of the Prior Art] It drives with the picture signal by which the indicating equipment of the active-matrix mold conventionally equipped with the light emitting device of the above-mentioned current drive mold for every pixel was digitized. The data line and Above TFT (it drives based on the scan signal supplied from the scanning line, and connects with each light emitting device.) in displaying the image corresponding to the picture signal concerned, after changing the digitized picture signal concerned into an analog picture signal generally It minds and the configuration which impresses and carries out spontaneous light of the analog picture signal concerned to the light emitting device concerned is taken.
[0003] Here, in case the above-mentioned picture signal is changed into an analog picture signal, it is necessary to use the so-called digital to analog converter (for a D/A converter to only be called hereafter.).
[0004] At this time, there are the so-called capacity type of D/A converter and the so-called resistance type of D/A converter in a general thing from the former as a D/A converter.
[0005] Among these, there is a D/A converter using the so-called ladder resistance which connected resistance in the shape of a ladder among the D/A converters of a resistance mold, and since the D/A converter using the ladder resistance concerned is easy to integrate, it is suitable to incorporate in the display of the above-mentioned active-matrix mold.
[0006]
[Problem(s) to be Solved by the Invention] However, when the D/A converter using the above-mentioned ladder resistance is used, in order to drive the light emitting device of a current drive mold using the drive current which has a big current value, the resistance of each resistance which constitutes the D/A converter concerned needed to be made small, therefore there was a trouble that the power consumption as the whole will increase. This trouble does big effect especially as what invites useless current consumption in the display of the above-mentioned active-matrix mold which must be equipped with the above-mentioned D/A converter about each of the data line of a large number corresponding to the light emitting device of a large number which should be driven.
[0007] On the other hand, when the D/A converter of the above-mentioned capacity mold is used, in order to acquire the drive current of a big current value, it is necessary to enlarge capacity value in the D/A converter concerned, and the trouble that integration will become difficult will occur in this case.
[0008] Then, this invention was accomplished in view of each above-mentioned trouble, and the technical problem is to offer the electronic equipment using the display which can control and low-power-ize useless current consumption, and the display concerned while being able to drive a light emitting device using the drive current which has a big current value.
[0009]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention according to claim 1 Luminescence means, such as two or more light-emitting polymer of a current drive mold contained,

respectively in two or more pixels formed in the shape of a matrix on substrates, such as a transparence substrate, The digital data signal concerned is changed into an analog data signal by adding unit current which has the amount of unit current set up beforehand corresponding to digital value contained in a digital data signal. It has digital to analog driving means, such as a data-line drive circuit of a current addition mold which impresses the analog data signal concerned to each aforementioned luminescence means, and drives the luminescence means concerned, respectively.
[0010] According to the operation of invention according to claim 1, two or more luminescence means of a thin-film-ized current drive mold are included, respectively in two or more pixels formed in the shape of a matrix on a substrate.
[0011] And by adding unit current corresponding to digital value contained in a digital data signal, a digital to analog driving means of a current addition mold changes the digital data signal concerned into an analog data signal, impresses the analog data signal concerned to each luminescence means, and drives the luminescence means concerned, respectively.
[0012] Therefore, since a luminescence means of a current drive mold is driven by digital to analog driving means of a current addition mold, while being able to drive a luminescence means by big drive capacity, generating of useless drive current can be controlled and low-power-ized.
[0013] In order to solve the above-mentioned technical problem, invention according to claim 2 While connecting with the scanning line with which a scan signal is supplied in an indicating equipment according to claim 1 at said digital to analog driving means [the data line with which said analog data signal is supplied, and in each aforementioned pixel] Said scanning line, It connects with said data line and said luminescence means, respectively, said analog data signal is supplied to said luminescence means corresponding to said scan signal supplied from said scanning line, and it has further switching means, such as TFT which drives the luminescence means concerned.
[0014] According to the operation of invention according to claim 2, in addition to an operation of invention according to claim 1, a scan signal is supplied to the scanning line.
[0015] On the other hand, an analog data signal is supplied to the data line connected to a digital to analog driving means.
[0016] And it connects with the scanning line, the data line, and a luminescence means into each pixel, respectively, and a switching means supplies an analog data signal to a luminescence means corresponding to a scan signal supplied from the scanning line, and drives the luminescence means concerned.
[0017] Therefore, since it has a switching means for every pixel and a luminescence means is driven, a high definition image can be displayed.
[0018] In order to solve the above-mentioned technical problem, each aforementioned switching means is constituted so that invention according to claim 3 may be a polish recon thin film transistor in an indicating equipment according to claim 2.
[0019] According to the operation of invention according to claim 3, in addition to an operation of invention according to claim 2, since each switching means is a polish recon thin film transistor, even if a high current for driving a luminescence means flows for a long period of time, drive capacity over a luminescence means does not decline.
[0020] In order to solve the above-mentioned technical problem, invention according to claim 4 includes current Miller circuit which impresses current which has the amount of current corresponding to digital value said digital to analog driving means is indicated to be by said digital data signal to each aforementioned luminescence means in an indicating equipment given in any 1 term of claims 1-3.
[0021] According to the operation of invention according to claim 4, in addition to an operation of invention given in any 1 term of claims 1-3, current Miller circuit included in a digital to analog driving means impresses current which has the amount of current corresponding to digital value shown by digital data signal to each luminescence means.
[0022] Therefore, since current is impressed by current Miller circuit, an analog data signal can be efficiently supplied to a luminescence means.
[0023] In order to solve the above-mentioned technical problem, invention according to claim 5 During a period which makes said luminescence means emit light in an indicating equipment of a publication corresponding to said digital data signal in any 1 term of claims 1-4, It has further load current impression means, such as TFT which always impresses load current which has the predetermined amount of current to which below the amount of current of a range where brightness changes in proportion to the amount of current in the current-brightness property of the luminescence means concerned was set beforehand to each aforementioned luminescence means, respectively, for every aforementioned luminescence means.
[0024] According to the operation of invention according to claim 5, to an operation of invention given in any 1 term of claims 1-4 in addition, a load current impression means which it had for every luminescence means Load current which has the predetermined amount of current to which below the amount of current of a range where brightness changes in proportion to the amount of current in the current-brightness property of the luminescence means concerned

was set beforehand is always impressed to each luminescence means, respectively during a period which makes a luminescence means emit light corresponding to a digital data signal.
[0025] Therefore, since brightness proportional to the amount of current of an analog data signal impressed in a luminescence means is obtained, an image which corresponded to a supplied digital data signal correctly can be obtained.
[0026] In order to solve the above-mentioned technical problem, each aforementioned luminescence means is constituted so that invention according to claim 6 may be light-emitting polymer in an indicating equipment given in any 1 term of claims 1-5.
[0027] according to an operation of invention according to claim 6 -- an operation of invention given in any 1 term of claims 1-5 -- in addition -- since each luminescence means is light-emitting polymer -- high -- a brightness image is obtained.
[0028] In order to solve the above-mentioned technical problem, electronic equipment according to claim 7 is constituted by any 1 term of claims 1-6 in a display of a publication.
[0029] According to the operation of invention according to claim 7, since it has a display given in any 1 term of claims 1-6 in electronic equipment, an image can be efficiently displayed with a low power.
[0030]
[Embodiment of the Invention] (I) The operation gestalt of a display, next the gestalt of the suitable operation for this invention are explained using a drawing.
[0031] The outline is explained using introduction and drawing 1 about the whole display configuration of the active-matrix mold with which this invention is applied.
[0032] As the plan is shown in drawing 1 , let a part for the center section of the transparence substrate 10 which is the base be the display 2 as which an image is actually displayed in the display 1 of an operation gestalt. And the inspection circuit 4 for inspecting the quality of the data-line drive circuit 3 as a digital to analog driving means which outputs a picture signal to the data line 6 based on the image which should be displayed, and the display 1 at the manufacture middle or the time of shipment, a defect, etc. is formed in a top and the bottom toward drawing 1 among the periphery sections other than display 2 of the transparence substrate 10 concerned.
[0033] Moreover, the scanning-line drive circuit 5 which outputs a scan signal to the scanning line 7 based on the image which should be displayed is formed in left-hand side and right-hand side toward drawing 1 among the periphery sections concerned.
[0034] Furthermore, the mounting terminal 9 for inputting the above-mentioned picture signal, various kinds of voltage, pulse signals, etc. from the outside is formed in the outside of the inspection circuit 4 on the transparence substrate 10.
[0035] Here, the field where the scanning line 7 of the data lines 6 and 1 of 1 crosses in a display 2 is made into the pixel 11 of 1, and in the pixel 11 concerned, the light-emitting polymer as a luminescence means, TFT for a drive, etc. are formed so that it may mention later (refer to drawing 3).
[0036] Furthermore, in the display 2, the capacity line 8 for the storage capacitance of the after-mentioned (refer to drawing 3) is arranged in parallel with the scanning line 7 within each pixel 11.
[0037] Next, the configuration member contained in the pixel 11 mentioned above is explained using drawing 2 and drawing 3 . In addition, drawing 2 is the plan showing arrangement of TFT currently formed by thin film-ized technology in the pixel 11, and drawing 3 is an equal circuit for every pixel 11.
[0038] Light-emitting polymer later mentioned in the pixel 11 of 1 as shown in drawing 2 (it is thin-film-ized, and the laminating of a spacer layer, an organic luminous layer, the hole-injection layer, etc. is carried out, and they are more specifically constituted.) And spontaneous light is carried out by the brightness proportional to the amount of current of the flowing current. TFT13 as a switching means for supplying the picture signal from the data line 6 to the pixel electrode 12 and the pixel electrode 12 concerned for receiving and impressing current is formed. this time -- TFT13 and the pixel electrode 12 concerned -- a thin film -- it is-izing and formed and has further the semiconductor layer (semiconductor layer in which a channel field, a source field, and a drain field are formed) made from polish recon about TFT13.
[0039] Moreover, the above-mentioned capacity line 8 for forming the storage capacitance later mentioned between the pixel electrodes 12 concerned (refer to drawing 3) is arranged in the location which counters the pixel electrode 12.
[0040] Here, the luminescent material used for light-emitting polymer in the indicating equipment 1 of an operation gestalt is explained more concretely.
[0041] The light-emitting polymer concerned is a light emitting device whose emitter contributed to luminescence is an organic material. And the following is mentioned as main features.
[0042] (1) Ink-izing, solution-izing, etc. are easy, and in case it is rich in thin film organization potency and this thin-

film-izes, while being able to do for a short time, multilayered-film-izing is easy.
[0043] (2) The physical reinforcement when thin-film-izing is high, and thereby, while being hard to produce crystallization or the condensation by aging (secular change), it is hard to generate a display defect like a sunspot.
[0044] (3) Pattern NINGU to a desired configuration is easy, it is possible to use the material which has photosensitivity, and pattern NINGU can be directly carried out using ink jet technology, printing technology, etc.
[0045] (4) A molecular design is very various, functional addition or control of the luminescent color is possible, thereby, color reproduction nature is high and it is possible to carry out functional addition of the photosensitivity further.
[0046] About the material used as the organic material concerned, furthermore, specifically As what has the orange luminescent color from red For example, the Pori [2-(2'-ECHIRUHEKI siloxy)-5-methoxy -1, 4-phenylenevinylene] (abbreviated-name MEH-PPV), Pori [2- (-- three -- seven - dimethyl -- octyloxy --) - five - methoxy - one -- four - phenylenevinylene --] (said OC1C10PPV) -- or -- Pori -- [-- two - (2'-ECHIRUHEKI siloxy) - five - methoxy - one -- four - phenylene - (1-cyano vinylene) --] (this MEH-CN-PPV) -- etc. -- it is -- Moreover, there is Pori [2, the 5-screw (HEKISHIROKISHI) -1, 4-phenylene-(1-cyano vinylene)] (this CN-PPV), or a poly thiophene to have the red luminescent color. Furthermore, there is Pori (Para-phenylenevinylene) (this PPV) or Pori [2-(dimethyl octyl silyl)-1, and 4-FINIREN vinylene] (this DMOS-PPV) to have the green luminescent color etc. There is m-LPPP etc. and there is Pori (PARAFENIREN) (this PPP), DO-PPP, PDAF, or P3 V/P5V grade to have the green luminescent color from blue to have the blue luminescent color.
[0047] Next, the equal circuit of each configuration member contained in the pixel 11 of 1 is explained using drawing 3 .
[0048] As shown in drawing 3 , the gate electrode G of TFT13 is connected to the scanning line 7 into the pixel 11 of 1, the source electrode S is connected to the data line 6, and the drain electrode D is further connected to the end of light-emitting polymer 14 and storage capacitance 15, respectively. And the other end of the light-emitting polymer 14 concerned and storage capacitance 15 is connected to the predetermined fixed potential which is not illustrated in common, respectively.
[0049] Next, the luminescence actuation in the pixel 11 of 1 is explained using the equal circuit shown in drawing 3 .
[0050] In the initial state which light-emitting polymer 14 has switched off, a scan signal is not impressed to the scanning line 7, therefore TFT13 is an OFF state.
[0051] Next, the analog picture signal corresponding to a picture signal is supplied by actuation of the data-line drive circuit 3 mentioned later to the data line 6. If a scan signal is impressed from the scanning-line drive circuit 5 to the scanning line 7 to the timing corresponding to supply of the analog picture signal concerned TFT13 will be in an ON state, the analog data signal transmitted by the data line 6 flows from the source electrode S to the drain electrode D, and while is further impressed to an electrode in light-emitting polymer 14 and storage capacitance 15.
[0052] And while the light-emitting polymer 14 concerned starts spontaneous light by the brightness proportional to the amount of current of the impressed analog data signal, a charge begins to be accumulated in storage capacitance 15.

[0053] After that, even if supply of the analog data signal from the data line 6 is completed, while the charge accumulated in storage capacitance 15 remains, current continues flowing to light-emitting polymer 14 succeedingly, and luminescence is continued.
[0054] Next, the configuration and actuation of the data-line drive circuit 3 concerning this invention are explained using drawing 4 and drawing 5 . In addition, drawing 4 is the block diagram showing the outline configuration of the data-line drive circuit 3 concerned, and drawing 5 is the circuit diagram showing the details configuration of the portion only corresponding to the pixel 11 of 1 of the 2nd latch circuit later mentioned among the data-line drive circuits 3 shown in drawing 4 , and a D/A converter.
[0055] Moreover, the configuration of the data-line drive circuit 3 explained below explains the case where the picture signal inputted from the outside through the mounting terminal 9 is a digital picture signal of a triplet. Furthermore, the data-line drive circuit 3 shown in drawing 4 is a drive circuit for [each] driving TFT13 to the so-called line sequential.

[0056] As shown in drawing 4 , the data-line drive circuit 3 is constituted by a shift register 20, switches 24 and 25, the 1st latch circuit 21, and D/A converter 23 prepared every data line 6 of the 2nd latch circuit 22 and 1.
[0057] Moreover, the 1st latch circuit 21 is constituted by latch circuit 21A, latch circuit 21B, and latch circuit 21C corresponding to each bit in a picture signal.
[0058] Furthermore, the 2nd latch circuit 22 is constituted by latch circuit 22A, latch circuit 22B, and latch circuit 22C corresponding to each bit in a picture signal.
[0059] Next, actuation is explained.

[0060] A switch 25 and the 1st latch circuit 21 sample the digital picture signal Sg of a triplet inputted from the outside based on control of a shift register 20.
[0061] Next, a switch 24 transmits the digital picture signal Sg for every bit by which is timing and the sampling was carried out [above-mentioned] shown by the latch signal Sl inputted from the outside to each latch circuit 22A in the 2nd latch circuit 22 thru/or 22C.
[0062] And the 2nd latch circuit 22 is the timing which carries out the line sequential drive of the light-emitting polymer 14 in each pixel 11, and outputs the digital picture signal Sg for every bit by which the transfer was carried out [above-mentioned] to D/A converter 23 each data line 6 of every.
[0063] Next, each D/A converter 23 is changed into the analog picture signal which has the current value of the magnitude which is proportional to the digital value shown with the digital picture signal Sg concerned every data line 6 about the digital picture signal Sg inputted, and is supplied to each data line 6.
[0064] Then, predetermined current will be impressed to light-emitting polymer 14 through each above TFT 13 by the analog picture signal concerned, and the light-emitting polymer 14 concerned will emit light.
[0065] Next, the details configuration and actuation of D/A converter 23 concerning this invention are explained using drawing 5 .
[0066] As shown in drawing 5 , D/A converter 23 The 1st bit in the digital picture signal Sg (it is equivalent to 20.) Switches 30A and 31A and TFT32A corresponding to the shown 1st bit signal Sga which were prepared, and the 2nd bit in the digital picture signal Sg (it is equivalent to 21.) Switches 30B and 31B and TFT32B corresponding to the shown 2nd bit signal Sgb which were prepared, and the 3rd bit in the digital picture signal Sg (it is equivalent to 22.) It is constituted by Switches 30C and 31C and TFT32C corresponding to the shown 3rd bit signal Sgc which were prepared, TFT33 prepared in each bit in common and TFT34 as a load current impression means, resistance 35 thru/or 38, and the gate change over circuit 39. Here, current Miller circuit consists of each of TFT 32A, 32B, 32C, and 34, and TFT33 so that clearly from drawing 5 .
[0067] Furthermore, if the channel width in each of TFT(s) 32A, 32B, and 32C sets channel width of TFT32A to W, the channel width of TFT32B is 2W, and channel width of TFT32C is set to 4W. In addition, at this time, the channel length of TFT 32A, 32B, 32C, 33, and 34 does equality, and is taken as that of a potato.
[0068] Thereby, the current I which flows to TFT32A when TFT33 and TFT32A become coincidence with an ON state is I=ix (W/w), when the current which flows to TFT33 is set to i and channel width of TFT33 is set to w.
Current I' which flows to TFT32B when a next door, next TFT33 and TFT32B become coincidence with an ON state is set to I'=ix(2 W/w) =2I. Furthermore," "is set to current [which flows to TFT32C] II=ix(4 W/w) =4I when TFT33 and TFT32C become coincidence with an ON state.
[0069] On the other hand, when TFT33 and TFT34 concerned become coincidence with an ON state, let channel width of TFT34 be the channel width to which the current which has the smallest amount It of current among the amounts of current of the range where brightness changes in proportion to the amount of current in the current-brightness property (refer to drawing 6) of light-emitting polymer 14 flows to TFT34.
[0070] Next, actuation is explained.
[0071] As shown in drawing 5 , based on the 1st bit signal Sga, latch circuit 22A is the timing which drives a pixel 11 to line sequential, and it sets switch 30A to OFF at the same time it sets switch 31A to ON, when the 1st bit signal Sga concerned is "1." Furthermore, switch 30A is set to ON at the same time it sets switch 31A to OFF to the same timing, when the 1st bit signal Sga concerned is "0."
[0072] Like this, based on the 2nd bit signal Sgb, latch circuit 22B is the timing which drives the same pixel 11 as latch circuit 22A to line sequential, and it sets switch 30B to OFF at the same time it sets switch 31B to ON, when the 2nd bit signal Sgb concerned is "1." Furthermore, switch 30B is set to ON at the same time it sets switch 31B to OFF to the same timing, when the 2nd bit signal Sgb concerned is "0."
[0073] Furthermore, based on the 3rd bit signal Sgc, latch circuit 22C is the timing which drives the same pixel 11 as latch circuit 22A or 22B to line sequential, and it sets switch 30C to OFF again at the same time it sets switch 31C to ON, when the 3rd bit signal Sgc concerned is "1." Furthermore, switch 30C is set to ON at the same time it sets switch 31C to OFF to the same timing, when the 3rd bit signal Sgc concerned is "0."
[0074] By this TFT(s) 32A, 32B, and 32C It is based on actuation of the each switch 30A concerned 30C and 31A thru/or 31C. TFT33 and current Miller circuit are constituted in each, and it carries out so that the above-mentioned current I, I', or I" is supplied to the data line 6 according to "1" of each bit, or "0", respectively, or it may not supply (when a bit is "1") (when a bit is "0").
[0075] and -- TFT -- 32 -- A -- 32 -- B -- or -- 32 -- C -- having flowed -- current -- I -- I -- ' -- or -- I -- " -- mutual -- adding -- having -- an analog -- a picture signal -- Sa -- ****** -- the data line -- six -- minding -- TFT -- 13 -- a drain -- an electrode -- D -- impressing -- having .

[0076] Next, it explains using drawing 5 , illustrating more concretely the actuation mentioned above.
[0077] By the following explanation, when the 2nd bit signal Sgb and the 3rd bit signal Sgc are "1", respectively and the 1st bit signal Sga is "0" as an example, the case where "6" (= 20x0+21x1+22x1) is inputted as a digital picture signal Sg is explained.
[0078] After the digital picture signal Sg which has digital value "6" is sampled by the 1st latch circuit 21 of the above, and the switch 25, it is inputted into latch circuits 22A, 22B, and 22C for each bit of every, respectively as the 1st bit signal Sga, the 2nd bit signal Sgb, or the 3rd bit signal Sgc.
[0079] Since the 1st bit signal Sga is "0" at this time, latch circuit 22A is the timing which drives a pixel 11 to line sequential, and it sets switch 30A to ON at the same time it makes switch 31A off. Thereby, Current I does not flow in TFT32A.
[0080] On the other hand, since the 2nd bit signal Sgb is "1", latch circuit 22B is the timing which drives a pixel 11 to line sequential, and it sets switch 31B to ON at the same time it makes switch 30B off. Thereby, to TFT32B, above-mentioned current I' (=2I) flows.
[0081] Next, since the 3rd bit signal Sgc is "1", latch circuit 22C is the timing which drives a pixel 11 to line sequential, and it sets switch 31C to ON at the same time it makes switch 30C off. Thereby, to TFT32C, above-mentioned current I" (=4I) flows.
[0082] Therefore, the current value supplied to TFT13 as an analog picture signal Sa is set to 2I+4I=6I. Now, since the digital value inputted as a digital picture signal Sg is "6", light-emitting polymer 14 will emit light by this by the brightness (brightness 6 times the brightness [namely,] of corresponding to digital value "1") corresponding to the digital value concerned.
[0083] On the other hand, in parallel to actuation of TFT32A mentioned above thru/or 32C, the gate change over circuit 39 makes TFT34 an ON state, when any 1 signal is "1" among the 1st bit signal Sga thru/or the 3rd bit signal Sgc.
[0084] If TFT34 will always constitute current Miller circuit between TFT(s)33 and TFT34 concerned will be in an ON state at this time Since it is constituted so that the brightness of light-emitting polymer 14 may supply the current which has the smallest amount It of current among the amounts of current of the range which changes in proportion to the amount of current to the data line 6 As a result, when making the light-emitting polymer 14 in a pixel 11 turn on by one of brightness, the above-mentioned analog picture signal Sa will always be overlapped on the load current which has a current value It, and it will flow.
[0085] Therefore, since the above-mentioned analog picture signal Sa is supplied in the range which changes in proportion to the current value to which the brightness of light-emitting polymer 14 flows, light will be emitted by the brightness to which the light-emitting polymer 14 concerned is also proportional to the current value (namely, digital value of the digital picture signal Sg) of the analog picture signal Sa correctly.
[0086] Since only the current which carries out the direct drive of the light-emitting polymer 14 is used while being able to drive by big drive capacity according to actuation of the indicating equipment 1 of an operation gestalt since the light-emitting polymer 14 of a current drive mold is driven by D/A converter 23 of a current addition mold as explained above, generating of useless drive current can be controlled and low-power-ized.
[0087] Furthermore, since it has TFT13 every pixel 11 and light-emitting polymer 14 is driven, it is highly minute and the high-definition image which does not have a cross talk in an image can be displayed.
[0088] Moreover, since it is each thin film transistor in which TFT13 is formed of polish recon, even if the high current for driving light-emitting polymer 14 flows for a long period of time, the drive capacity does not decline.
[0089] Furthermore, since current Miller circuit is constituted within D/A converter 23 and the analog picture signal Sa is impressed again, the analog picture signal Sa can be efficiently supplied to light-emitting polymer 14.
[0090] Moreover, even if it compares with the D/A converter of an another side type, since there are very few element numbers required for a configuration, it is suitable as a drive circuit which needs to be arranged like especially an indicating equipment at a ** pitch.
[0091] Furthermore, since the element which carries out spontaneous light is light-emitting polymer 14, the rich image of high brightness and color reproduction nature is obtained by carrying out the molecular design of the suitable organic material.
[0092] In addition, although the above-mentioned operation gestalt explained the case where light-emitting polymer 14 was used as a light emitting device, this invention can be widely applied to the display using the light emitting device of current drive molds, such as organic or inorganic EL (ElectroLuminescence) element, in addition to this.
[0093] (II) The operation gestalt of electronic equipment, next the operation gestalt of the various electronic equipment using the display 1 of an operation gestalt mentioned above are explained using drawing 7 thru/or drawing 9.
[0094] The electronic equipment constituted using the above-mentioned display 1 is constituted including the source

1000 of a display information output shown in drawing 7 , the display information processing circuit 1002, the display drive circuit 1004, a display panel 1006, the clock generation circuit 1008, and a power circuit 1010.
[0095] Among these, the source 1000 of a display information output is constituted including the tuning circuit which aligns and outputs memory, such as ROM (Read Only Memory) and RAM (Random Access Memory), and a TV signal, and outputs display information, such as a video signal, based on the clock signal from the clock generation circuit 1008.
[0096] The display information processing circuit 1002 processes and outputs display information based on the clock signal from the clock generation circuit 1008. This display information processing circuit 1002 can include an amplifying circuit, a phase expansion circuit, a rotation circuit, or a clamping circuit.
[0097] Next, the display drive circuit 1004 is constituted including a scan side drive circuit and a data side drive circuit, and carries out the display drive of the display panel 1006.
[0098] And a power circuit 1010 supplies power to each above-mentioned circuit.
[0099] The equipment equipped with the video tape recorder of the personal computer corresponding to multimedia (PC) shown in drawing 8 and an engineering workstation (EWS) or a cellular phone, a word processor, television, a viewfinder mold, or a monitor direct viewing type, an electronic notebook, an electronic calculator, car navigation equipment, the POS terminal, and the touch panel as electronic equipment of a configuration of having mentioned above can be mentioned.
[0100] The personal computer 1200 shown in drawing 8 has the main part section 1204 equipped with the keyboard 1202, and the display 1206 containing the display of this invention.
[0101]
[Effect of the Invention] While being able to drive a luminescence means by big drive capacity according to this invention since the luminescence means of a current drive mold is driven by the digital to analog driving means of a current addition mold as explained above, generating of useless drive current can be controlled and low-power-ized.
[0102] therefore, a low power -- efficient -- high -- a brightness image can be obtained.

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CLAIMS

[Claim(s)]
[Claim 1] A display characterized by providing the following Two or more luminescence means of a current drive mold contained, respectively in two or more pixels formed in the shape of a matrix on a substrate A digital to analog driving means of a current addition mold which changes the digital data signal concerned into an analog data signal, impresses the analog data signal concerned to each aforementioned luminescence means, and drives the luminescence means concerned, respectively by adding unit current which has the amount of unit current set up beforehand corresponding to digital value contained in a digital data signal
[Claim 2] While connecting with the scanning line with which a scan signal is supplied in an indicating equipment according to claim 1 at said digital to analog driving means [the data line with which said analog data signal is supplied, and in each aforementioned pixel] Said scanning line, A display characterized by having further a switching means to connect with said data line and said luminescence means, respectively, to supply said analog data signal to said luminescence means corresponding to said scan signal supplied from said scanning line, and to drive the luminescence means concerned.
[Claim 3] It is the indicating equipment characterized by each aforementioned switching means being a polish recon thin film transistor in an indicating equipment according to claim 2.
[Claim 4] It is the indicating equipment characterized by including current Miller circuit which impresses current which has the amount of current corresponding to digital value said digital to analog driving means is indicated to be by said digital data signal in an indicating equipment given in any 1 term of claims 1-3 to each aforementioned luminescence means.
[Claim 5] During a period which makes said luminescence means emit light in an indicating equipment of a publication corresponding to said digital data signal in any 1 term of claims 1-4, A display characterized by to have further a load current impression means always impress load current which has the predetermined amount of current to which below the amount of current of a range where brightness changes in proportion to the amount of current in the current-brightness property of the luminescence means concerned was set beforehand to each aforementioned luminescence means, respectively, for every aforementioned luminescence means.
[Claim 6] It is the indicating equipment characterized by each aforementioned luminescence means being light-emitting polymer in an indicating equipment given in any 1 term of claims 1-5.
[Claim 7] Electronic equipment characterized by equipping any 1 term of claims 1-6 with a display of a publication.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the plan showing the whole display configuration.
[Drawing 2] It is the plan showing the concrete configuration of a pixel portion.
[Drawing 3] It is the equal circuit of a pixel portion.
[Drawing 4] It is the block diagram showing the configuration of a data-line drive circuit.
[Drawing 5] It is the circuit diagram showing the details configuration of a D/A converter.
[Drawing 6] It is drawing showing the current-brightness property in light-emitting polymer.
[Drawing 7] It is the block diagram showing the outline configuration of electronic equipment.
[Drawing 8] It is the front view showing the appearance of a personal computer.
[Description of Notations]
1 -- Display
2 -- Display
3 -- Data-line drive circuit
4 -- Inspection circuit
5 -- Scanning-line drive circuit
6 -- Data line
7 -- Scanning line
8 -- Capacity line
9 -- Mounting terminal
10 -- Transparence substrate
11 -- Pixel
12 -- Pixel electrode
13, 32A, 32B, 32C, 33, 34 -- TFT
14 -- Light-emitting polymer
15 -- Storage capacitance
20 -- Shift register
21 -- The 1st latch circuit
21A, 21B, 21C, 22A, 22B, 22C -- Latch circuit
22 -- The 2nd latch circuit
23 -- D/A converter
24, 25, 30A, 30B, 30C, 31A, 31B, 31C -- Switch
G -- Gate electrode
D -- Drain electrode
S -- Source electrode
Sg -- Digital picture signal
Sga -- The 1st bit signal
Sgb -- The 2nd bit signal
Sgc -- The 3rd bit signal
Sa -- Analog picture signal
Sl -- Latch signal

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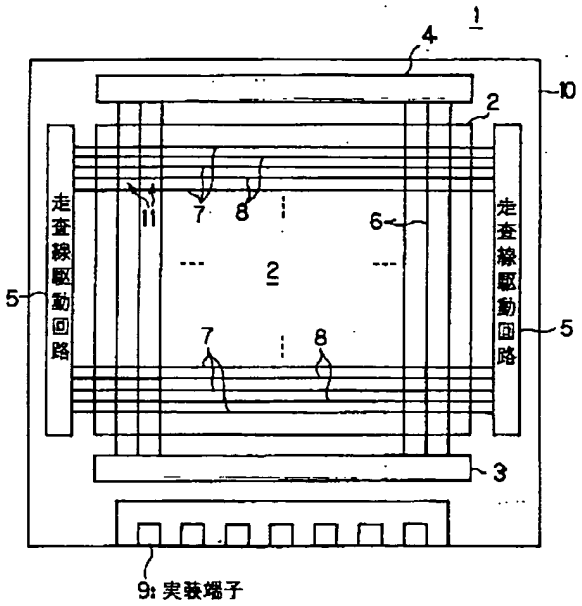
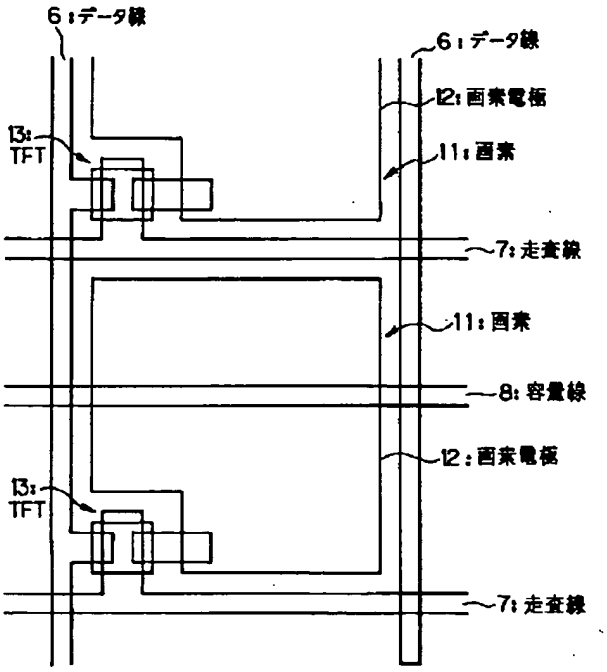
DRAWINGS

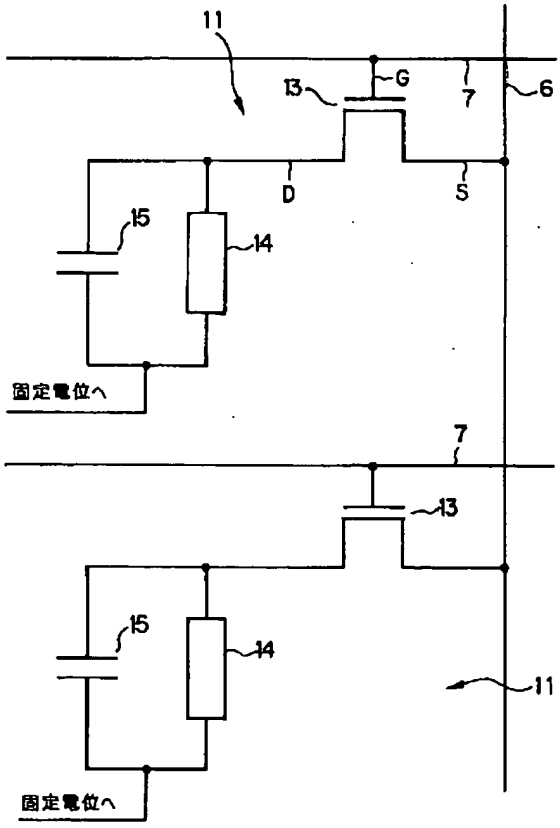
[Drawing 1]



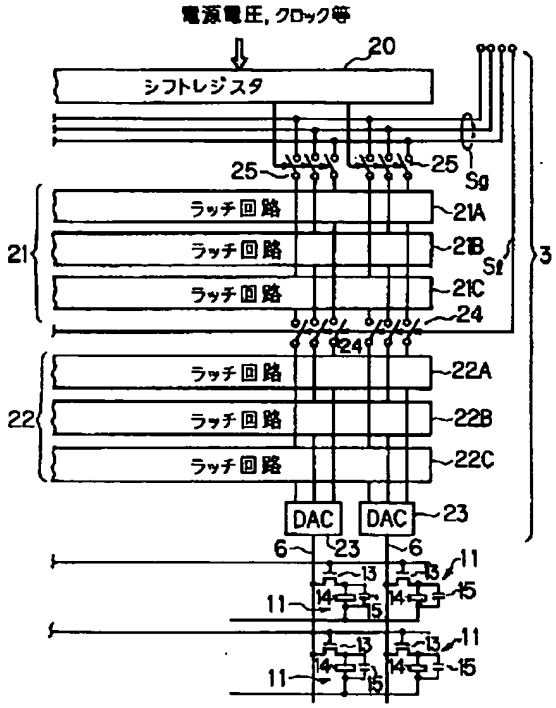
[Drawing 2]



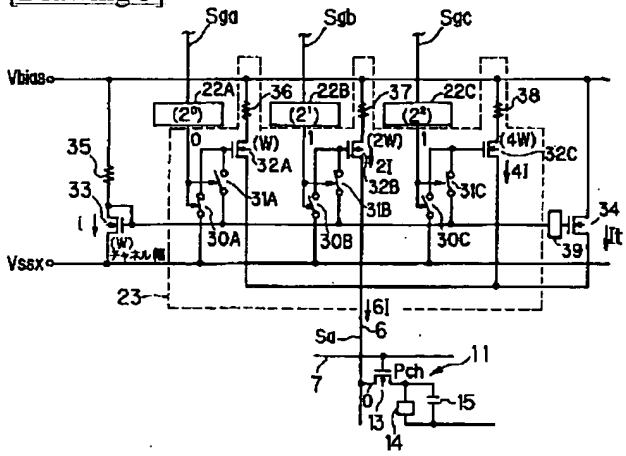
[Drawing 3]



[Drawing 4]

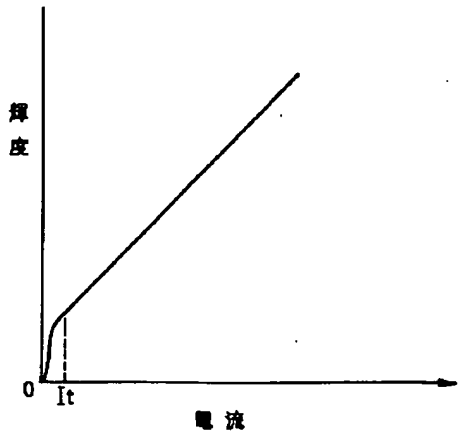


[Drawing 5]

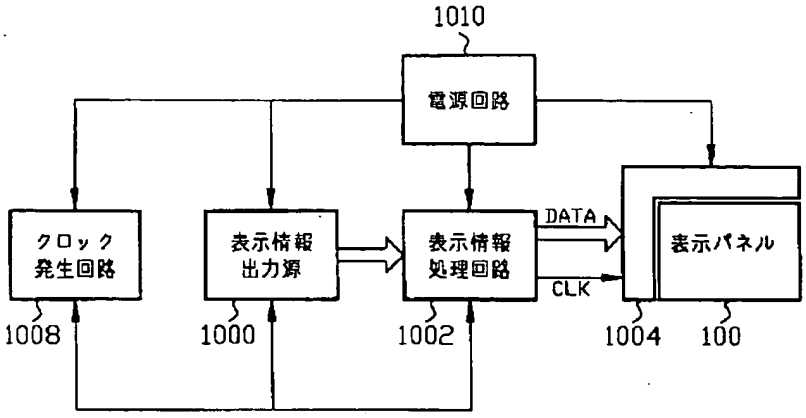


[Drawing 6]

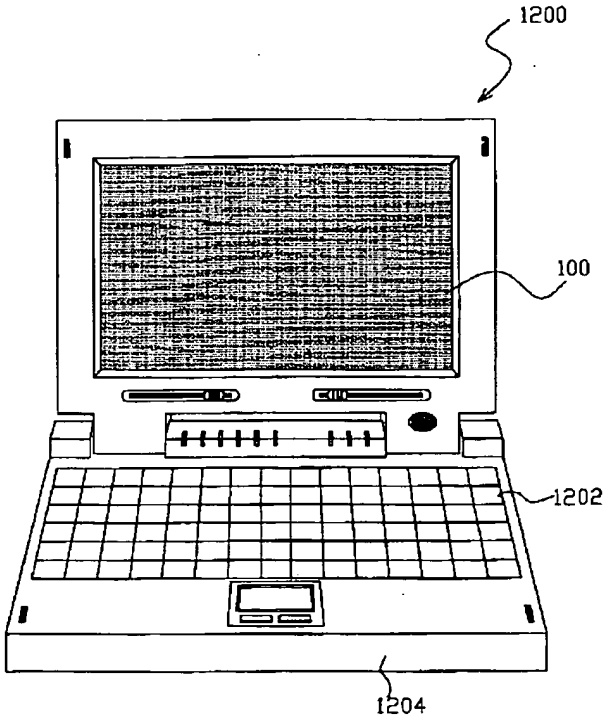
ライトエミッティングポリマーにおける電流ー輝度特性



[Drawing 7]



[Drawing 8]



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